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The Humanities and Social Sciences in Graduate Engineering Education: A case in the Green Asia Program at Kyushu University

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Abstract

In the era of globalization, it is imperative that we recognize diversity as well as universality. The perspective provided by the humanities and social sciences would be advantageous to comprehend diversity in the globalized world and consequently deepen the students understanding of technology which they have studied. In this paper, I introduce the “inter-disciplinary” attempts made by the Green Asia Program at Kyushu University. The Green Asia Program provides various “inter-disciplinary” subjects and course-work, in order to cultivate leaders in the field of engineering who can combine the ideals of protecting the environment and economic growth. I present actual practices used in the Green Asia Program, and then I point out two key findings. Firstly, some students have misunderstood social science as exclusively only normative discourses. Secondly, several students, particularly Japanese students, worried about spelling out social matters on their home countries in English because they do not know the technical terms used within the field. These findings suggest that the significance of dialogue and the importance of attention to the level of focus in the education.

Keywords: Globalization, Engineering Education, Green Asia Program, Social Science, Environmental Policy, Methodology

1. Introduction

According to Thomas Friedman, the Pulitzer prize winning journalist, globalization is “the inevitable integration of markets, nation-states and technologies to a degree never witnessed before – in a way that is enabling individuals, corporations and nation-states to reach around the world farther, faster, deeper and cheaper than ever before and in a way that is enabling the world to reach into individuals, corporations and nation-states farther, faster, and deeper, cheaper than ever before.”[1]

In this era of globalization, it is essential that we recognize diversity as well as universality. In order to diffuse certain technology or manufacturing goods in an integrated “one” world economy, a uniform standard is preferable. On the contrary, it is necessary to produce goods and services tailoring to the diversity each country has, because globalization not only deepens integration among developed countries who have economic infrastructure and administrative institutions in common, but also connects many developing countries who have a variety of economic systems and government capacities. In considering the feasibility and applicability of technology, it is important to pay attention to the immense diversity emerging from the process of globalization. Whether we are conscious or not, technology premises a certain social system where such technology functions well. Now, it becomes the crucial agenda for engineering education to provide a curriculum to educate competent students who are capable of designing goods and innovating technology ascertaining both universality and diversity. The perspective provided by the humanities and social sciences should be conducive to comprehend diversity in a globalized world and consequently deepen the students understanding of the technology they have studied.

This agenda would inevitably compel the current Japanese education system to evolve. Until recently, it is fair to say that education in Japan had generally been a “closed” system. With some limited exceptions, the current system had aimed to educate students who would work exclusively in the domestic scene. Therefore, many universities had not actively adopted foreign lecturers, except in the faculty of foreign languages, and seldom gave any lectures in English. Like the other areas, engineering education in Japan unconsciously had premises the domestic context, though a handful of engineers transferred overseas might have shared their personal findings of foreign countries among only their colleagues. Moreover, in Japan people tend to emphasize the definitive distinction between “Ri-kei” (collective term includes disciplines such engineering, physics, chemistry and so forth) and “Bun-kei” (sociology, law, politics, economics, history and so on), though this grouping seems to be similar to the classification between arts and science. However, this distinction is not self-evident. If we look at environmental problems in particular, an inter-disciplinary approach is prudent. For instance, the issue of hazardous waste is not only concerned with the technological matters of how to treat the toxic materials, but also administrative management matters on how to control the transnational streamline of waste. We can no longer regard these two boundaries, domestic/international and “Bun-kei”/ “Ri-kei”, as fixed.

Currently, in order to have students acquire both knowledge and the way of thinking necessary in the era of globalization, many universities have started brand new educational programs prioritizing “globalization” and
"inter-disciplinary" study. Several educational programs at undergraduate as well as graduate school level have already started new attempts to take in the humanities and social sciences in the curriculum of engineering education along the more tangible objective than before.

In the following chapters, I would like to introduce the Green Asia (GA) Program at Kyushu University as one of the above-mentioned cases, and how we managed to design several subjects and course-work related to the humanities and social science disciplines in graduate engineering education.

2. The Humanities and Social Sciences in the Green Asia Program Curriculum

With the support of the MEXT (Ministry of Education, Culture Sports Science and Technology), Kyushu University started a new graduate education program, the Advanced Graduate Program in Global Strategy for Green Asia, in 2013. This program aims at developing leadership in science and engineering to realize a balanced greening and economic growth in Asia. The students belong to departments of the graduate school of Engineering Science (IGSES) as well as graduate school of Engineering: material science, system engineering, resource engineering and material science and engineering. Every year, this program accepts approximately ten graduate students from Japan and overseas countries respectively.

In addition to science and engineering, the curriculum of Green Asia Program includes the humanities and social sciences subjects. It is mandatory for students to take at least 12 credits among subjects categorized as Social System, Environmental System, and Economic System within a 5 years doctoral program. Moreover, students can conduct social science research in the scheme of a laboratory rotation, where students work in three different laboratories for about three months during their Master’s course period. Last but not least, International Exercise A is also an opportunity for graduate students to learn social scientific thinking. In this class, students are expected to consider the applicability and feasibility of technologies relevant to their Ph.D. studies, eventually to write up the paper as “Green Asia Industry Paper”.

![Diagram of the Green Asia Education System](source: Brochure on the Green Asia, p. 7.)

The goal of a series of these classes is that students can broaden their understanding of the environment and acquire the abilities of upstream thinking. The lectures of those who make a commitment to these subjects try to provide the “creative” class for engineering student with repeated revision of an original plan. The problem, however, is that the framework and method on the interdisciplinary education between engineering and social science have hardly been discussed in Japan. Therefore, lecturers must inevitably design their classes based on only their limited experience in education. I also managed to organize the content of classes reflecting my experience in giving lectures on environmental policy for only undergraduate students majoring in “Ri-kei” subjects as well as “Bun-kei” subjects.

The classes categorized into social, environmental and economic systems introduce how the current political and economic construct operates. For instance, “Social System 2” examines various environmental problems at the national level as well as the international level, drawing on cultural and economic diversity of Asian countries. Furthermore, introducing environmental issues such as Climate Change and transnational movement of hazardous waste, this class considers international environmental politics in which states seek to strike a balance between national interest and global environmental sustainability. Taking up “Environmental system 2”, it covers environmental problems in international and domestic (mainly, Japan) water management, mainly focusing on the political and social aspects. And the former part approaches “water” management at the international level. This class examines the question of how international laws stipulate who governs the ocean and international rivers, what responsibility national governments take for maritime pollution, and so forth. The latter part addresses national policy (especially Japan) toward sustainable
waste management and development.

Fig. 2. The Laboratory Rotation (Brochure on Green Asia Program, p. 10.)

What are the research themes the GA students chose in the laboratory rotation? Currently, in the laboratory rotation scheme, four GA students had conducted their research taking the social science approach: comparative studies on a "sustainable city", research review on the Porter Hypothesis about environmental regulation stimulating innovation, examination on revised rule for nuclear power plant inspection since 2013 in Japan, and Indonesian governmental policy on biomass power generation. I think that it is important to become accustomed to the approach used commonly in social science through actual exploration, although it is only a rudimentary practice because of the very limited period.

In the next section, I present the perspectives, framework and methods in my mind when I provide lectures and supervise students in laboratory rotation, and then I refer to the findings from my experience in the GA program.

3. The Perspectives in the Humanities and Social Science Education of the GA Program
When I give lectures in the GA graduate program, first of all, the perspective I want to stress is to show how political and economic systems affect the perception of environmental risk in society. Looking at sociology, several scholars have long debated the above-mentioned "socially constructed risk". Douglass and Wildavsky, U.S. sociologists, argue that the selection of particular risk is culturally determined. They emphasize that the assessment of risk is not simply based on "objective and "rational" scientific knowledge, rather socially constructed conduct which reflects the societies political, economic and moral values [2].

In "social system 2", looking back to the history of Japan, South Korea, China and the other Asian countries since the 20th century, for example I mentioned the cases in which the "Minamata Disease" patients in Japan, neurological disorder caused by mercury poisoning, suffered from the prejudice held in the local community and the pressure from local residents whose livelihood depended upon the polluter, chemical company Chisso Ltd., in a rural area. In these cases, the real scale and seriousness of Minamata disease has taken a long time to surface. Moreover, I introduce that there is a problem about the "Kogai-Kanja", officially designated victim of pollution - related diseases those who are entitled to adequate financial support for medical care from the government. If the patients do not exhibit all or most symptoms the government identifies as the "Minamata disease", they cannot be qualified as an officially designated victim of the pollution - related diseases even if they have some symptoms. This treatment comes from the logic of politics as well as bureaucracy those who have had concern about governmental financial burden rather than medical judgement. Consequently, the Japanese government has created a deep fault line between the "designated victim" and the "non-designated victim" among the "Minamata Disease" patients. [3]

The second point is that the approach of environmental policy each county adopts is rather different even if the counties face same environmental problem such as air pollution. As for environmental policy, David Vogel, the U.S. political scientist, examines the difference in environmental regulatory policy style between the United States and United Kingdom: "most rigid and rule-oriented" and "most flexible and informal". Vogel explains that this dichotomy stems from political institution as well as the relationship between government and industry in each country.[4]

Drawing on this finding, I urge the student to pay attention to the typology of environmental policy: command and control, and economic instrument such as environmental tax or emission trading. For instance, along with regulation, Japanese government actively introduced several public environmental financing schemes through the Pollution Control Service Corporation or Japan Finance Corporation for Small and Medium Enterprises in the 1960s. On the contrary, environmental policy in South Korea is characterized by several environmental assortments. The reason why certain environmental technology and not the other has diffused can be explained by not only the comparative superiority in technological performance but also the difference in environmental policy style. Based on these examples, I encouraged students to discuss and examine the advantages and disadvantages of these environmental policies.

Next, I would like touch upon the method of the laboratory rotation. Until today I had supervised four GA students under the scheme of laboratory rotation. In my supervision, I set objectives for students to write up short essay reconsidering the social context for their research in the engineering field. In order to enable them to learn the framework and approach of social science, I gave the students a reading assignment especially focusing on case studies to elucidate causal nexus between governmental policy and environmental performance output. Based on the handout
which summarizes the articles by the students, we discussed and confirmed the scope and methodology adopted in the article. I choose this interactive method through examining empirical case studies rather than the manner of reading the textbook on methodology in social sciences, because it is difficult for engineering students to understand methodology in social science without preliminary knowledge of social sciences. As the matter of fact, almost all textbooks on methodology in social science are naturally for the student majoring in social science subjects. One should be cautious about using textbooks frequently, though, in looking through these textbooks, the lecturer is expected to familiarize themselves with the scope and methodology in many social science subjects not limited their own research field.

Then, what are the findings from the above mentioned communication with students? Firstly, some students had thought that the social science discipline is a world full of normative discourse. Admittedly, ethics or philosophy deals with the matter of norm. Certainly, it is difficult to distinguish strictly from “what ought to be” and what it is”, above all, when we talk about social problems, as it is well known as the “is- ought problem” articulated by Scottish philosopher David Hume in the 18th century.[5] However, the objective of most of social science disciplines such as sociology, political science and economics is, first of all, to explore causal mechanism about which and how certain factor affects outcome. In general, utilizing statistics, comparative methods and so forth, researchers in social sciences identify the correlation between social phenomenon X and Y, and then they move to the next phase to probe the causal relations deductively or inductively. Arguably, social science gives weight to, if not rigorous, “scientific method” to identify “objective” facts, analyze causal nexus and examine theory, same as the method in the discipline of engineering as well as physical science students engage every day. Although it does not mean that normative argument is useless, it is important for engineering graduate students to recognize this practice common in almost all subjects.

Secondly, as far as I observe the class discussion among students and the term papers submitted by students, it seem that some GA students, particularly Japanese students, are not so good at developing arguments to explain social phenomena occurring in their home country. Although almost all GA students can present their research process in engineering field logically, their attitudes often give the impression that their argument is illogical when they talk about social problems. It is because they do not give the supplementary information necessary to make the students from the other countries understand their social system. It is likely that they, especially some Japanese students, do not manage to explain as far as possible but omit additional explanation when they do not know technical term to describe social settings exactly. It is desirable that students try to communicate while keeping in their mind that the complicated social settings are not easily understandable if we miss out indispensable explanation because of the huge diversity in each country’s social context in the era of globalization.

4. Conclusion
Unfortunately, the examination in this paper remains only descriptive rather than analytical. It is difficult to draw a general conclusion on the humanities and social sciences in graduate engineering education. However, I would like to refer to a few implications, reflecting upon my findings.

First of all, it is the significance of dialogue. From the viewpoints of social scientists, many Japanese engineering students lack experience in talking about social matters. This is unavoidable because most graduate engineering students is busy in making experiments. However, through the discussion with the others, we can deepen our understanding of not only social environment but also research plan in engineering. In my supervision under the laboratory rotation, I found that through interactive communication, engineering students can surprisingly improve their critical thinking despite the very limited period. It is important that the supervisor manages to have occasions to talk with the student about social matters even if these are only chats.

Secondly, it is crucial to pay much attention to the problem and the level of analysis. Unlike engineering, physics or chemistry, social science does not use instrumentation examination of phenomena, therefore, social scientists consciously shift the focus of analysis to explore causal nexus of social phenomena, such as the level of community, state and so forth. I reason that confusions students conceived in the class sometimes stem from this level of analysis problem. As for the class in the humanities and social sciences, it is better, I suppose, we avoid addressing the abstractive question, such as capitalism, from the inception, rather we start with showing an explanation to social matters along the ladder of abstraction. I believe that this is also helpful to develop systems aiming to understand the context technology applies.

As far as I know, the number of students engaged in inter-disciplinary education, above all for graduate education, is still small in Japan. It is essential that we present practices and findings from each university and school and share knowledge.

Note
The views expressed in this paper are solely those of the author and do not represent the Green Asia Program at Kyushu University.

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Biography
He was born in Fukuoka, Japan, in 1977. He received the L.L.B. from the Kyushu University, Fukuoka, Japan, in 2000, and the L.L. M. from the Kyushu University, in 2002. He had held lecturing positions as adjunct lecturer at Saga University, Saga, Japan, and University of Nagasaki, Sasebo, Japan, for several years. He is currently an Assistant Professor of the Green Asia Educational Center at Kyushu University, Fukuoka, Japan. His current research interests include global environmental politics, the Basel convention on transboundary movement of hazardous waste, and political process of the European Standardization System in product design for environmental.

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